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RAT CONTROL

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CONTENTS

SUMMARY

For permanent rat control, make all buildings rat proof. For temporary control, use either red squill or barium carbonate in meat, cereal, fruit or vegetable baits. Supplement baiting with trapping and with fumigation, using either calcium cyanide or car exhaust gas. Observe proper precautions in handling, storage and use of poisons.

Rat Control

By G. C. Decker, H. Gunderson and H. J. Barre*

During the past few years the rat population in Iowa has built up until it is now estimated that there are more than 5 million rats in the state. This rapid increase in population is due primarily to the tremendous volume of corn which is stored in temporary, hastily-constructed cribs that offer easy access to rats and furnish both food and shelter for them.

To meet this situation, it is urged that rat control be made an integral part of good farm practice. Since rats move about from farm to farm, especially when they are disturbed by a vigorous control campaign on the part of a few farmers, community cooperation is desired.

Rats menace not only our food and our farm animals; from the standpoint of health they threaten both humans and domestic animals, since they may act as reservoirs of infectious jaundice, endemic typhus and bubonic plague in man and trichinosis of hogs.

LIFE HISTORY

The necessity for frequent poisoning is illustrated by a brief review of the life cycle of the brown or Norway rat. Rats begin to breed at 3 or 4 months of age, the gestation period is short (21 to 25 days), and litters vary in size from 6 to 22. The number of young per litter in Iowa probably averages 9 to 10. The brown rat may breed every month in the year, but in this region there are probably 6 to 8 litters per year. Using these data, one statistician has estimated that the progeny from one pair of rats might exceed 350 million in 3 years. Even if, under natural conditions, rats increase by only a small fraction of this rate, it is easy to understand why poisoning must be done frequently in order to keep rat populations within limits.

* The section of this bulletin on Making Farm Buildings Rat Proof was written by Professor Barre while the other parts were written by Professors Decker and Gunderson.

Fig. 1. Rat damage to corn crib. Here rats have completely gnawed through one board and have seriously damaged others.

RAT DAMAGE

Rats will eat practically anything used as food by man or domesticated animals. In Iowa they feed principally upon grain, and the greatest amount of damage is done to corn stored in cribs and bins. Here they also waste and contaminate many times the amount of corn actually eaten.

Rat damage in corn is particularly important, since the grade of the corn may be lowered due to increased "cracked-corn and foreign material," and objectionable odors. Furthermore, market for corn contaminated with rat excrement is limited. Livestock, particularly horses and cattle, will often refuse to feed on rat-contaminated corn. Rat damage to kernels greatly increases the probability of infestation by stored-corn insects.

Rats damage cribs and granaries by gnawing into boards (fig. 1) and in some cases by gnawing holes through the roof. They frequently burrow under shallow foundations and un-

der concrete feeding floors, causing them to crack and collapse.

There are many cases on record where rats have attacked new-born pigs, calves and baby chicks.

RAT CONTROL

The most satisfactory rat control is obtained by thoroughly rat-proofing all farm buildings. This method will pay big dividends over a period of years, since approved rat-proofing methods are merely principles of sound construction. Buildings now standing can be rat-proofed at low cost, and all new construction should be built rat-proof. Rat-proof construction is discussed fully beginning on page 118 of this bulletin.

Where rat-proofing is impossible or impractical, other methods of control must be used. These will consist of a combination of the following: Poisoning, trapping, fumigation of burrows and nests, the use of a good rat dog and general clean-up of trash on the premises.

POISON BAIT

Poison bait properly used is the most efficient and the most economical means of destroying rats. Success in poisoning depends largely upon the baits used and the methods of mixing and distributing them. It is equally important that one select an effective poison and a bait base that will be attractive to the rats.

Kinds of Poison

Barium Carbonate is poisonous, tasteless, odorless, slow in action and inexpensive. The only objection to it is that it cannot be distributed promiscuously without endangering other animals. It is fatal to dogs, cats, chickens and larger animals if eaten in sufficient quantity.

Red Squill as a rat poison has the advantage of being relatively harmless to human beings and domestic animals. This is due in part to its objectionable taste and also to the fact that it acts as an emetic when taken in dangerous quantities. It is particularly desirable to use red squill baits where the use of more toxic poisons would be inadvisable.

Other Poisons: Occasionally some of the more toxic poi-

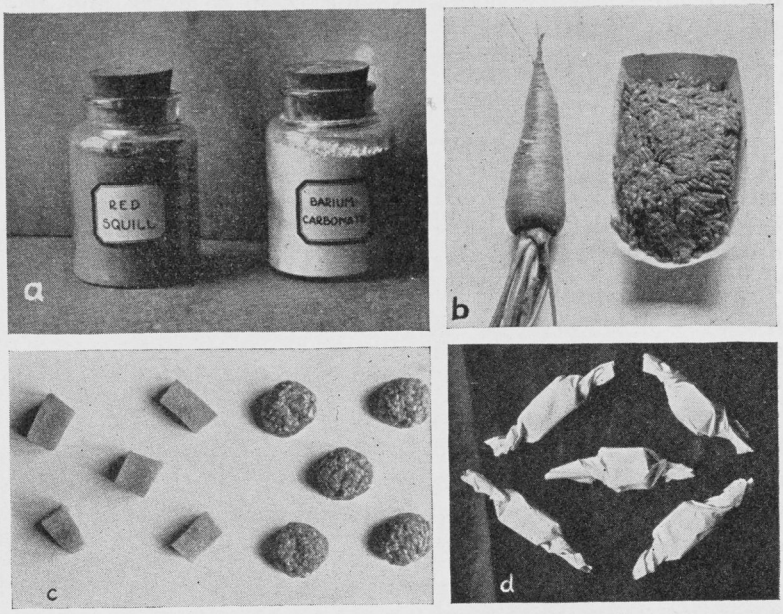

Fig. 2. Steps in preparing rat baits.
a. Use either one of these poisons.
b. Use vegetable, ground meat or cereal as bait.
c. Prepared baits before wrapping.
d. Prepared wrapped baits ready for distribution.

sons are used with success. Of the many poisons that will, when properly prepared, destroy rats, phosphorous, arsenic, strychnine and thallium have been used. All of these are extremely poisonous and are not generally recommended because of the danger to humans and livestock.

Kinds of Baits

If the rat is offered a choice of foods, the probability of the bait being taken is greatly increased. Stale or decaying bait material should not be used.

Meats: Fresh meats, such as hamburg steak, sausage, salmon or sardines should be thoroughly ground in a meat chopper. Fresh fish is one of the most attractive baits.

Cereals such as bread, cornmeal and rolled oats should have milk or water added, and the mixture stirred to a mushy consistency.

Fruits and Vegetables such as apples, melons, carrots, etc.,

should be cut into small slices (for example an average-size apple into about 24 parts) and the poison dusted over them to insure an even distribution. In some cases it may be advisable to slightly moisten the slices before adding the poison.

Preparation and Distribution of Baits

The powdered barium carbonate or red squill should be thoroughly mixed with the ground meat, cereal or other bait material with the hands, a spoon or wooden paddle until a uniform bait is obtained. The correct proportions for mixing are:

Barium carbonate 1 pound, bait material 5 pounds.

or

Red squill 1 ounce, bait material 1 pound.

Fruits and vegetables should be cut in ½-inch cubes, moistened slightly with water and the poison sprinkled over them.

A single cube of fruit or a scant teaspoonful of one of the mixed baits is sufficient for the average rat. If divided into portions of this size 1 pound of ground meat will yield from 100 to 150 baits. For several reasons the individual baits should be wrapped in small squares of paper and the paper twisted at each end (fig. 2). Paper-wrapped baits remain cleaner and fresher and therefore are more attractive to the rats. These baits are less apt to be taken by other animals, and they are easily recognized when uneaten baits are collected.

Poisoned baits should be distributed in the evening near all places frequented by rats. If barium carbonate is used, cats, dogs and poultry should be shut up for the night. Uneaten baits should be picked up and destroyed the next morning before releasing domestic animals.

Always be sure that there are enough baits to supply all of the rats on the premises. An excess is good insurance and not a waste.

It will frequently be necessary to bait a second or even a third time, since experiments have shown that no poison is 100 percent effective. Red squill may be expected to kill from 60 to 90 percent of the rats in from 48 to 96 hours after feeding, and barium carbonate should give mortalities ranging from 80 to 100 percent in from 60 to 92 hours. Rats recovering after baiting, particularly where red squill is used, are shy about eating baits a second time.

It is probable that best results from the second and third baitings will be obtained if the carrier and possibly the poison are changed. One might use ground meat for the first baiting, ground fish for the second and apple, squash, pumpkin, peanut butter or banana for the third.

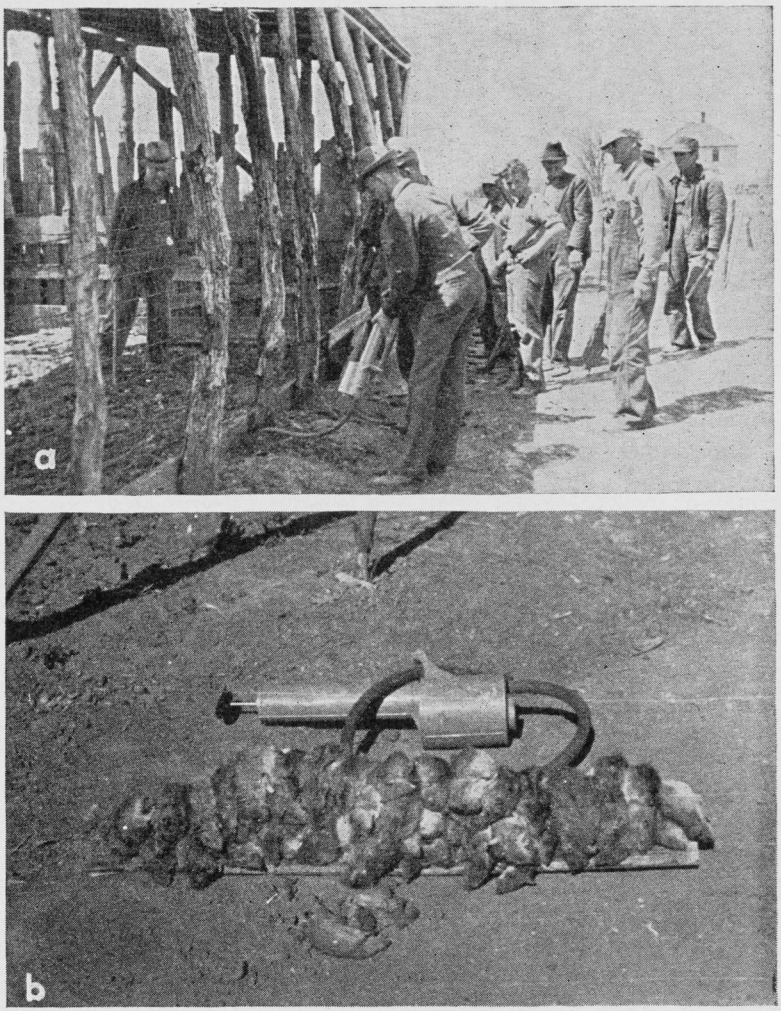

Fig. 3. Cyanide fumigation.
a. Demonstrating the use of the cyanide gas gun. b. A close up of the gas gun and the results of its proper use.

Prebaiting

Whenever rats refuse to take baits as a result of suspicion aroused by previous baiting operations, prebaiting is recommended. This consists of exposing fresh unpoisoned bait for one or two times at about 2-day intervals (pick up in each case the following morning) until any suspicion the rats may have had is overcome. Then poisoned bait should be substituted.

ANTIDOTE FOR POISONS

Give an emetic consisting of either mustard or salt dissolved in warm water, or induce vomiting by inserting the finger in the back of the throat. Follow vomiting with a liberal dose of Epsom or Glauber Salts. Call a physician immediately.

Caution: Barium carbonate is a relatively mild poison, but the danger from accidents must be emphasized. **Keep it out of reach of children, irresponsible persons and domestic and wild animals.** Although red squill is not known to be poisonous to domestic animals, it should not be placed in locations accessible to them.

FUMIGATION

Baiting should be supplemented by fumigation with calcium cyanide (fig. 3) or with car exhaust gas (fig. 4) whereever possible. Fumigation is most successful in burrows, under corncribs or other buildings where floors are tight and gas concentrations can be built up rapidly.

Calcium cyanide is purchased as a dust and is generally forced into the burrows with a regular hand or pump-type dust gun. When the dust comes into contact with the moisture in the air or in the soil, a very poisonous gas is formed which kills rats in a very few minutes. It has been found that during the winter gas is not formed rapidly enough to give good results, therefore, the use of calcium cyanide during cold weather is not recommended.

Car exhaust gas is equally effective at high and low temperatures. An adapter to fit any car or tractor can be made quickly and with little expense from a half-gallon can, a male connection such as is used on common garden hose and a

radiator hose clamp. With tight hose connections at least 100 feet of hose may be used without appreciable loss of gas.

Fumigation of corncribs is ineffective with either of these gases unless the crib is first made tight with heavy building paper.

It must be remembered that both of these gases are toxic to all animals, and precautions should be taken in their use. When fumigating under chicken houses, hog houses, or other buildings housing animals, the livestock should be removed and kept out of the building until all signs of gas are gone. Containers of calcium cyanide should be opened out-of-doors and unused material stored where it is safe from children and irresponsible persons.

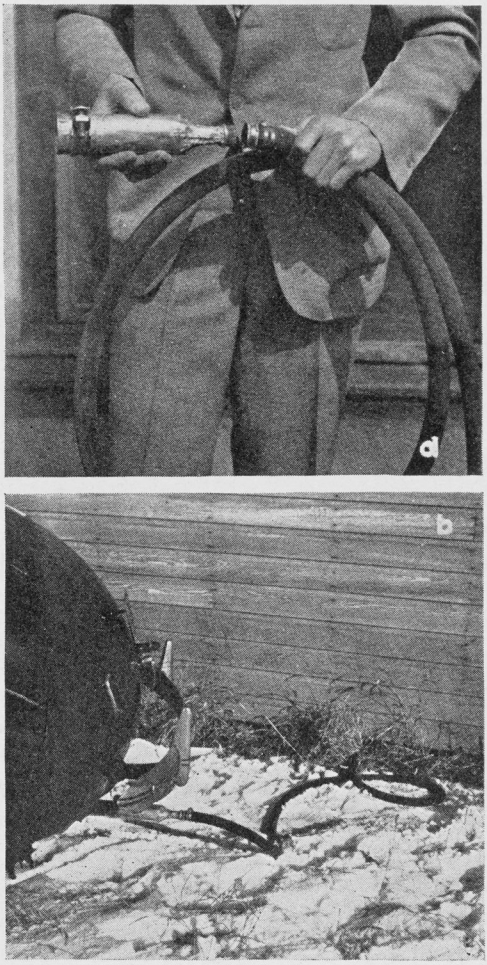

Fig. 4. a. Adapter for using car exhaust gas in rat fumigation. b. Adapter in use.

TRAPPING

Trapping may be successful for a short period of time, but rats soon become suspicious and learn to avoid the traps. Best results from trapping are obtained by careful preparation and infrequent use of traps. An inexpensive yet successful trap may be prepared by filling a

barrel half-full of water and then pouring 1 to 2 buckets of oats on the water. The barrel should then be placed where rats will be able to get into it. Farmers report catching as many as 70 rats in such a trap in one night.

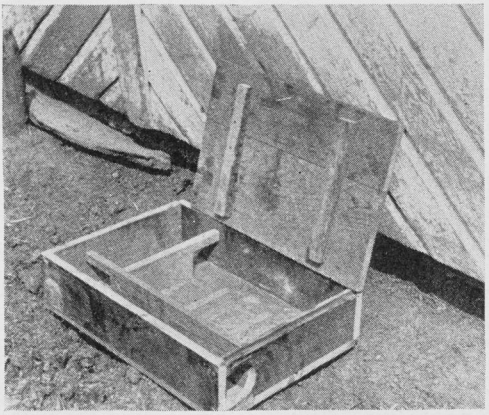

Fig. 5. Permanent rat bait station. Should be used after an intensive control campaign to kill rats as they reinfest the farm.

OTHER METHODS

Dogs: After a thorough and persistent rat-control campaign, a good rat dog will be of great help in keeping rat populations down. Rats migrate from one farm to another, and unless some such means is used, the farm will soon be reinfested with rats.

Fig. 6. Trash piles such as this invite rat infestation.

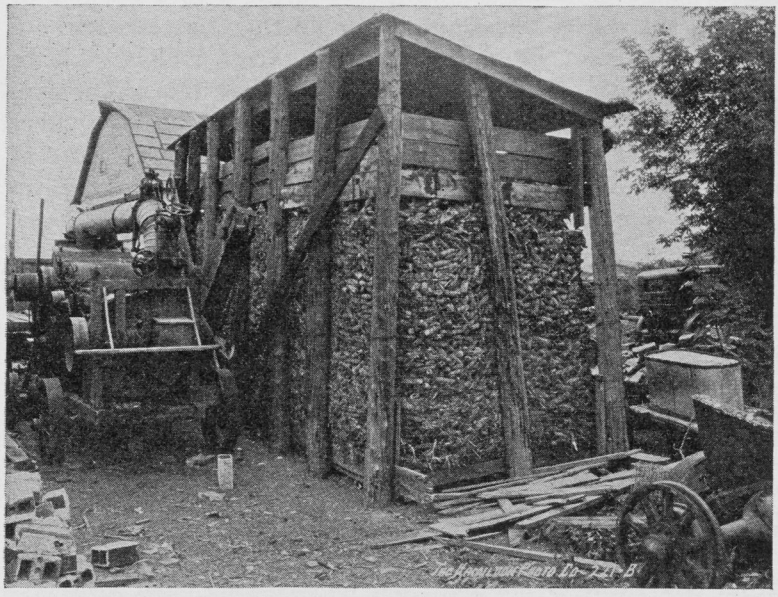

Fig. 7. A rat paradise.

Clean-up: Rats are found most abundantly where hiding places and food are most favorable. Any farm on which there are piles of trash, where weeds have grown up around corncribs and where garbage has accumulated will offer an excellent harboring place for rats. Buildings should be raised off the ground or placed on concrete foundations. Fence posts and lumber should be piled on sawhorses off the ground. Garbage should be kept in tightly covered cans or burned so that rats will not have access to it.

MAKING FARM BUILDINGS RAT PROOF

In making old buildings rat proof, usually only minor changes are required. New buildings often can be made rat proof when constructed without additional expense.

Two general principles in making buildings rat proof should be observed. First, exterior parts of buildings, including walls, doors and other openings which are accessible to rats must be such as to keep them out. Second, all places

favorable for rat harbors within the building should be avoided or removed. These include accessible spaces between walls, ceilings and floors and places under and around equipment within buildings, such as mangers, stalls, feeders and grain bins. Good construction is in itself nearly rat proof. For example, fire stopping of walls serves also as protection against rats.

FOUNDATIONS

Ordinarily, foundations should be continuous and extend to a depth not less than 24 inches below the ground line. Foundations for permanent buildings are usually deeper than this. Only permanent materials such as concrete or brick laid in mortar should be used. The top of the foundations should project a foot or more above ground to protect the wood structure resting on it. Rats will not hang to the exposed exterior of a wall of a building while gnawing a hole.

Farm buildings such as cribs and granaries on piers made of concrete, masonry or wood blocks should be at least 18 inches above the ground level to allow good lighting, ventilation and easy access by dogs and cats (fig. 8). Rats will not remain in places where there is plenty of light. Covering openings beneath buildings with lattice work keeps out dogs and cats but protects the rats.

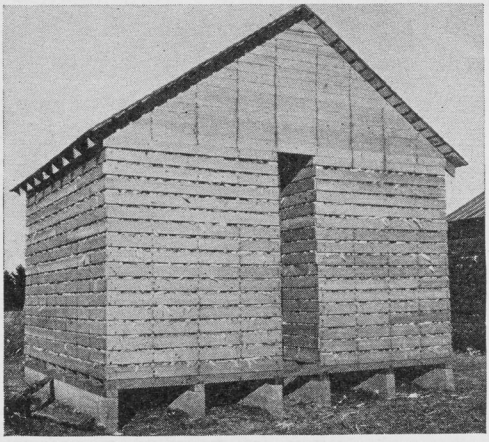

Fig. 8. The foundation under this crib is high enough above ground level to discourage the hiding of rats underneath. Added protection probably is not necessary to keep rats from gnawing through the wall and entering the crib.

Old foundations made of rocks and hollow tile blocks without the use of a cement mortar are often infested with rats. The cracks between the stones and the openings in

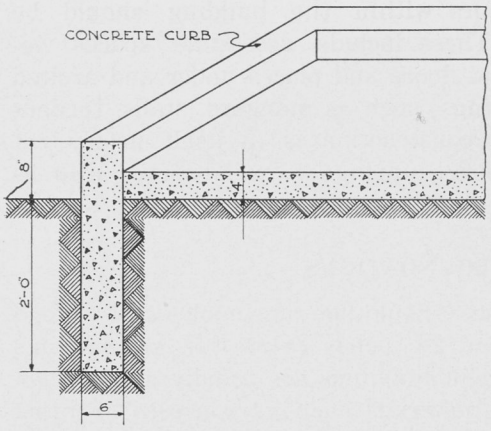

Fig. 9. A concrete apron and continuous footing is essential for feeding floors to keep the rats from burrowing and the hogs from rooting under the floor. Reinforcing in the floor in the form of heavy wire mesh or woven wire fence will keep cracks in floor from developing.

the hollow tile can be filled with a cement mortar.

All openings in continuous foundation walls, including those for pipes, should be filled with cement mortar.

FLOORS

Floors should be made of concrete or other acceptable types of masonry materials wherever possible. These may be laid directly upon well-drained, well-packed soil, or upon a base of compacted cinders, gravel or stone. Old wood floors only a few inches above ground should be replaced with concrete. Concrete feeding floors should have a continuous foundation around the entire outer edge (fig. 9) to prevent rats from burrowing underneath.

Wood floors treated with creosote have been observed to be effective in preventing rat damage. If applied with a paint brush rather than by the pressure method the treatment may have to be repeated occasionally in order to remain effective.

WALLS

Even when the top of the foundation wall is 12 inches

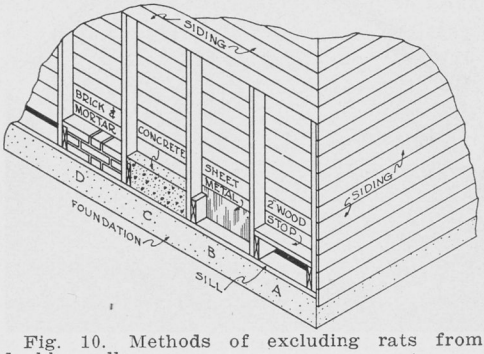

Fig. 10. Methods of excluding rats from double walls:
A. A wooden stop made of 2-inch lumber is sometimes used.
B. Sheet metal may be used to close openings in old and existing buildings.
C. Stop made of concrete.
D. Stop made of brick laid up in mortar.

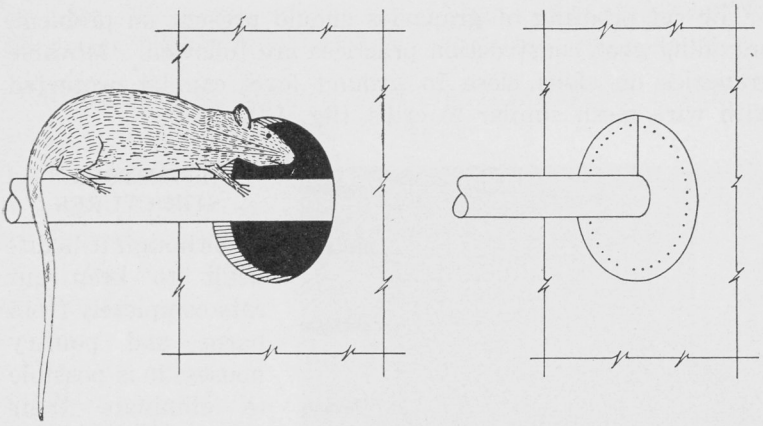

Fig. 11. Openings around pipes running through walls should be flashed with sheet metal.

above the ground line, rat stops just above the sill in double walls should be provided as shown in fig. 10. These will also serve as fire stops.

Rats may often gain entrance to buildings by climbing outside walls as in corncribs. If this is serious, suitable barriers in the form of sheet metal strips placed around the entire building may be supplied (fig. 13).

All openings in walls, including those for pipes, should be flashed with galvanized sheet metal (fig 11). All other openings, such as ventilation intakes, should be covered with half-inch hardware cloth.

CORNCRIBS AND GRANARIES

Rats and mice may cause not only the loss of an appreciable portion of corn held over winter but may do damage to cribs and granaries (fig. 12). One of the principal advantages in the use of concrete in foundations and floors is the protection made possible against rodents.

Wood floors should be at least 18 inches above ground level to discourage the harboring of rats. If only a few inches off the ground, rats can harbor there and in burrowing will pile moist earth against the floor joists and sills, which generally causes early rotting and failure.

The rat proofing of granaries should present no problem, providing good construction practices are followed. Movable granaries on skids close to ground level can be protected with wire mesh similar to cribs (fig. 13).

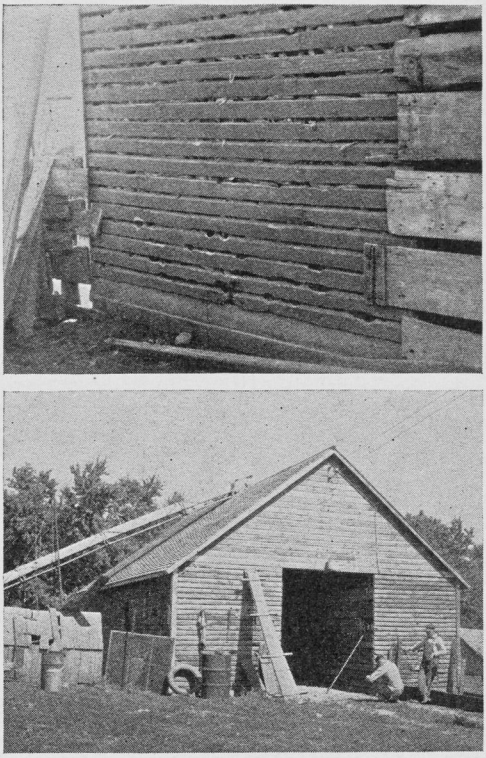

Fig. 12. Two views of the same crib badly infested with rats. The top view shows damage to the cribbing. The floor is practically at ground level. The view in the lower photo shows numerous boards and equipment, including the portable elevator leaning against the building, which afford the pests easy access even if good rat protection were provided otherwise.

LIVESTOCK STRUCTURES

Although it is difficult to keep out rats completely from barns and poultry houses, it is possible to eliminate their harbors, including places under wooden mangers, stall partitions and old floors. Wooden mangers and partitions should be reconstructed so that they will be at least 12 inches above the floor, and old floors should be replaced with concrete.

Walls in barns or poultry houses lined on the inside with wood or insulation board should be protected from rats by filling the wall above the sill to a height of about 10 inches with concrete or bricks laid in mortar, or a strip of half-inch hardware cloth or galvanized sheet metal 18 inches wide should be placed under the inside wall lining.

Grain bins and similar places in barns or poultry structures where feeds are stored should be rat proofed. They should

be lined with sheet metal and so located that there will be no spaces behind or under them where rats can hide.

RECOMMENDATIONS FOR RAT-PROOFING FARM BUILDINGS

1. Extend concrete foundation walls or footings for permanent buildings at least 2 feet below ground level.
2. Extend concrete foundation high enough to make the top of the floor 12 inches above ground line.
3. Provide rat stops in the wall space of double walls just above the sill by using either sheet metal, concrete, brick laid in mortar or wood boards 2 inches thick.
4. Place wood floors not less than 18 inches above ground level. Where wood floors are less than this height apply a coat of creosote on floor boards, providing the creosote odor is not objectionable.
5. Place a concrete foundation wall under the outer edge of concrete feeding floors and other similar floors. This should extend not less than 24 inches below ground level.
6. Cover all permanent openings in buildings, such as ventilation intakes, with one-fourth inch hardware cloth. Provide doors with spring hinges or similar devices to insure their automatic closing.
7. Cover all openings around pipes running through walls and floors with sheet metal flashing.

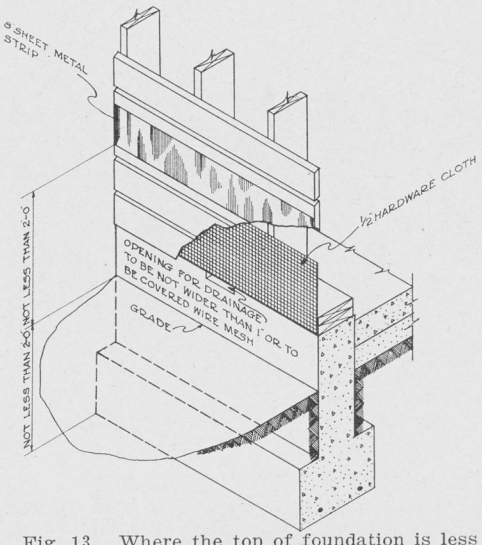

Fig. 13. Where the top of foundation is less than a foot above ground level, adequate protection can be obtained by the use of hardware cloth and a strip of sheet metal 8 inches wide placed about 2 feet above ground level.

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